

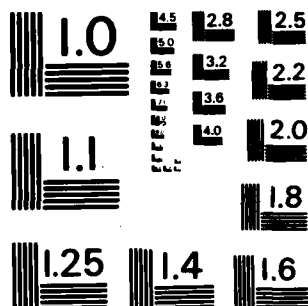
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OPERATING AND SUPPORT COST ESTIMATING GUIDE SAMPLE 1/1
ANALYSIS NAVY AIR... (U) COST ANALYSIS IMPROVEMENT GROUP
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OPERATING
and
SUPPORT

COST ESTIMATING GUIDE

SAMPLE ANALYSIS
NAVY AIRCRAFT AT DSARC II

Office of the Secretary of Defense
Cost Analysis Improvement Group

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FORWARD

DOD Directive 5000.4 "OSD Cost Analysis Improvement Group", provided the charter for the Cost Analysis Improvement Group (CAIG) to review and establish criteria, standards, and procedures concerning the preparation and presentation of cost estimates on defense systems to the DSARC and CAIG. In support of this objective, the CAIG has periodically issued guidance for development and presentation of Operating and Support (O&S) cost for OSD review. To date general guidance has been made available for aircraft, ships, and ground combat vehicles.

In consonance with that general guidance, the following sample of a CAIG Operating and Support Cost Estimate Report covering a hypothetical case has been developed to further assist the cost analyst in the preparation of cost estimating reports submitted to the DSARC and CAIG during the acquisition process of a new weapon system.

This sample is not intended to imply the existence of a specific acquisition program. Nor does it imply a preference for one analysis technique over another. The sample is intended to show an example of how Operating and Support Costs can be developed for CAIG review with available data bases and one example of an appropriate format for presentation of cost estimates.

The existing A-7E data base was used only to illustrate the need to relate an estimate to an existing similar system and to ensure a constant relationship between values and the Cost Element Structure. It is not used to promulgate the use of specific data bases. Each case should address that data which is the most complete and accurate for its purposes. Further, the level of detail depicted in this example may be greater than that which is available or appropriate to a specific case.

The sample is designed to complement the Cost Analysis Improvement Group's Aircraft Cost Development Guide. Jointly, these two documents can provide the basis for program manager developing a cost estimate that is acceptable for CAIG review.

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EXECUTIVE SUMMARY

Operating and Support (O&S) costs for the F/A-X and the current A-7E system (baseline) are shown below. These figures are compared to the figures presented to the DSARC at Milestone I.

DSARC I to DSARC II Comparison
FY 80 \$ - Millions, 12PAA/Sqdn

	DSARC I (31FH/PAA/Mo) (\$0.50/gal POL)		Current Estimate (27FH/PAA/Mo) (\$1.50/gal POL)	
	A-7E	F/A-X	A-7E	F/A-X
\$/Acft/yr	\$.8	\$1.0	\$1.0	\$1.2
\$/Sqdn/yr	\$9.9	\$11.7	\$11.7	\$13.8
15 yr Force O&S	\$1,661.0	\$1,959.8	\$2,221.7	\$2,636.8

The force O&S costs are based on a five year delivery schedule plus ten years of full force operations of 168 PAA

The costs growth reflected in both the A-7E, baseline and the F/A-X system is due mainly to the unprecedented rise in POL costs. This is in spite of a four hour per PAA reduction in the projected flying hour program. The current estimate of the F/A-X costs also includes costs covering an increase of 19 maintenance technicians

Although the F/A-X represents a dramatic increase in performance, O&S costs will increase by only 19% over the A-7E. This is due to

GUIDANCE: THE EXECUTIVE SUMMARY IS A SIMPLE ONE PAGE NARRATIVE PROVIDING THE BOTTOM LINE COSTS, FORCE SIZE AND MAJOR COSTS DRIVERS, AND ASSUMPTIONS. INCLUDE A BRIEF EXPLANATION OF DIFFERENCES PREDICTED FROM THE BASELINE SYSTEM AND THE DSARC MILESTONE I COST ESTIMATIONS.

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1. INTRODUCTION

The following cost analysis report is submitted in support of Defense Systems Acquisition Review Council (DSARC) Milestone II review of the F/A-X Program All values included in this report are in FY 80 dollars unless indicated otherwise.

GUIDANCE: IDENTIFY THE MILESTONE MISSION ELEMENT NEEDS STATEMENT (MENS) AND DECISION COORDINATING PAPER (DCP) WITH DATE AND THE BASE YEAR FOR COSTS IN THE INTRODUCTION.

The existing fleet of A-6As and A-7Es were designed in the 1950s and 1960s, and although they have proven to be capable aircraft, their designs will be over thirty years old in the 1990s. Their on board weapons delivery systems and self defense/warning systems render them

GUIDANCE: INCLUDE A SHORT STATEMENT SUMMARIZING THE MENS/DCP AND ANY SIGNIFICANT DEVIATIONS THAT THE COST ANALYSIS MAKES FROM THE DOCUMENTS.

The objective of this program is to provide an attack aircraft capable of performing strike and close air support to ground operations as well as being able to survive in the combat air environment of the 1990s and beyond

. . . Based on an evaluation of paper designs from . . . competing contractors, the F/A-X design met all operational requirements and was found to be most cost efficient in terms of supporting maintenance manpower and fuel consumption. A prototype has been built and flown by the selected contractor to evaluate areas of risk An artist's rendition/picture of this design is presented as Figure 1

GUIDANCE: ALSO, OUTLINE THE PROGRAM, ITS STAGE OF DEVELOPMENT, MAJOR SYSTEM PARAMETERS, AND MAJOR POTENTIAL RISKS THAT IMPACT OPERATING AND SUPPORT (O&S) COSTS.

Table 1 presents the Operating and Support (O&S) costs for the baseline aircraft (A-7E) and the prototype aircraft. The data is shown for a squadron of 12 aircraft operating for one year

In Table 2 the cost estimates presented at DSARC I are tracked to the current estimate and reasons for significant variances given

Table 3 presents the O&S costs for the life cycle of the prototype system with the procurement delivery schedule as listed in the Weapon System Planning Document (WSPD) for F/A-X dated

These costs are based on a squadron of mature aircraft. To account for non-operating time due to aircraft delivery schedules, all aircraft delivered within a given year are assumed to accrue costs for only half of the year of delivery.

GUIDANCE: THE TABLE LISTING THE O&S ANNUAL COSTS FOR A TYPICAL DEPLOYABLE UNIT SHOULD REFLECT THE COST ELEMENT STRUCTURE (CES) ARRIVED AT THROUGH CONSULTATION WITH THE COST ANALYSIS IMPROVEMENT GROUP (CAIG). THE COSTS SHOULD ALSO BE COMPARED TO THOSE PRESENTED TO THE DSARC AT MILESTONE I AND THE COSTS DIFFERENTIALS EXPLAINED THE O&S COSTS SHOULD ALSO BE PRESENTED BY FISCAL YEAR. THESE FIGURES SHOULD BE IDENTICAL TO THE FIGURES PRESENTED IN THE INTEGRATED PROGRAM SUMMARY (IPS) WITH THE DELIVERY SCHEDULES IDENTIFIED IN THE WEAPON SYSTEM PROGRAM DOCUMENT (WSPD).

ARTIST'S
RENDITION

Figure 1. F/A-X Aircraft

TABLE 1
TYPICAL ANNUAL OPERATING AND SUPPORT COSTS
(THOUSANDS, FY80\$)

1 SQUADRON, 12 PAA, 324FH/PAA/YR

<u>Cost Element</u>	<u>A-7E Baseline</u>	<u>F/A-X Est</u>
Unit Mission Personnel	\$3542	\$2875
Aircraft	\$ 513	\$ 486
Maintenance	2415	1821
Other	614	568
Unit Level Consumption	4467	5437
POL	3639	4578
Maintenance Material	587	631
Training Ordnance	241	228
Depot Level Maintenance	2508	4285
Airframe Rework	501	840
Engine Rework	968	1926
Component Repair	559	602
Support Equipment	-	11
Software	-	100
Modifications	-	-
Other Depot	472	806
Contract Unit Level Support	-	-
Sustaining Investment	524	682
Reparable Spares	130	201
Replacement Support Equip.	175	262
Modification Kits	219	219
Other Recurring Investment	-	-
Installation Support Personnel	148	119
Base Operating Support	140	113
Real Property Management	-	-
Medical	8	6
Indirect Personnel Support	296	239
Misc Operations Maintenance	-	-
Medical O & M (Non-Pay)	115	93
Permanent Change of Station	154	124
Temporary Additional Duty Pay	27	22
Depot Non-Maintenance	70	114
General Depot Support	70	114
Second Dest Transportation	-	-
Personnel Acquisition & Training	103	83
Acquisition	13	11
Individual Training	90	72
TOTAL	\$11,658	\$13,834

TABLE 2.

DSARC I TO DSARC II COMPARISON
ANNUAL OPERATING AND SUPPORT COSTS
(THOUSANDS, FY80\$)

1 SQUADRON, 12 PAA

Cost Element	Current	Est	DSARC I	Est	Change	Comments
Unit Mission Personnel		\$2875		\$2564	+ \$ 311	
Aircrew	\$ 486		\$ 486		-	
Maintenance	1821		1557		+ 264	1
Other	568		521		+ 47	1
Unit Level Consumption		5437		3956	+ 1479	
POL	4578		2944		+ 1634	2, 7
Maintenance Material	631		784		- 154	
Training Ordnance	228				-	
Depot Level Maintenance		4285		3947	+ 338	
Airframe Rework	840		443		+ 497	3
Engine Rework	1926		2244		- 298	4, 5
Component Repair	602		621		- 19	7
Support Equipment	11		11		-	
Software	100				+ 100	5
Modifications					-	
Other Depot	206		248		+ 58	
Contract Unit Level Spt	-				-	
Sustaining Investment		682		736	- 54	7
Reparable Spares	201		220		- 19	
Replacement SPT Equip.	262		264		- 2	
Modification Kits	219		252		- 33	
Other Recurring Invest	-		-		-	
Installation SPT Personnel		119		105	+ 14	
Base Operating Support	113		99		+ 14	6
Real Property Management	-		-		-	
Medical	6		6		-	
Indirect Personnel Support		239		209	+ 30	
Misc Operations & Maintenance	-		-		-	
Medical O&M (Non-Pay)	93		82		+ 11	6
Permanent Change of Sta.	124		108		+ 16	6
Temp A&D Duty Pay	22		19		+ 3	6
Depot Non-Maintenance		114		109	+ 5	
General Depot Support	114		109		+ 5	
Second Dest. Transportation	-		-		-	
Personnel Acquisition & Trng		83		73	+ 10	
Acquisition	11		9		+ 2	6
Individual Training	72		64		+ 8	6
SYSTEM TOTAL		\$13,834		\$11,699	+ \$2135	

Notes on Table 2:

1. Increase is due to the increase of 19 maintenance technicians over the original estimate.
2. Increase is due to the abnormal increase in Petroleum, Oils, and Lubricants (POL) costs from \$.50/gal to \$1.50/gal in constant FY80 dollars.
3.
6. Increases are due to larger squadron manpower being supported.
7. Flying hour program reduced from 31 to 27.

Table 3. Typical F/A-X Force Operating and Support Cost
(MILLIONS, FY80\$) FISCAL YEAR BREAKOUT
274 AIRCRAFT

	Fiscal Year									
	86	87	88	89	90	91	92-01	02	03	TOTAL
Number of Operating Squadrons	1	2	6	8	12	13	13	13	3	-
Deliveries **	12	12	48	48	48	48	56	-	-	274
Unit Mission Personnel	1.4	4.3	11.5	20.1	28.8	35.3	41.1	37.4	8.8	559.1
Installation Support Personnel	.1	.2	.5	.8		1.5	17.0	1.0	.4	23.2
*Subtotal (MILPERS)	1.5	4.5	12.0	20.9	30.0	37.0	42.5	38.9	9.0	582.3
Unit Depot Maintenance	2.7	8.2	23.0	38.1	54.4	68.2	78.5	70.8	16.3	1058.9
Depot Level Maintenance	2.1	6.0	17.2	30.1	42.9	55.7	558.1	55.8	12.9	779.2
Indirect Personnel Support		.4	1.0	1.7	2.4	3.0	34.2	3.1	.7	46.6
Depot Non-Maintenance	.1	.2	.5	.8	1.2	1.4	15.0	1.5	.3	21.0
Personnel Acquisition & Training	0	.1	.3	.6	.8	1.0	11.7	1.1	.2	15.8
*Subtotal (O&M)	5.0	15.3	40.8	71.3	101.7	127.2	1397.5	132.3	30.4	1921.5
Sustaining Investment	.3	1.0	2.7	4.8	6.8	8.6	97.8	8.9	2.1	133.0
*Subtotal (PROCUREMENT)	.3	1.0	2.7	4.8	6.8	8.6	97.8	8.9	2.1	133.0
*GRAND TOTAL	6.8	20.8	55.5	97.0	138.5	173.2	1923.4	180.1	41.5	2636.8

** Delivery schedule is based on WSPD on F/A-X dated _____.

GUIDANCE: *NOTE: FIGURES ARE ALSO INCLUDED IN ANNEX B OF THE INTEGRATED PROGRAM SUMMARY.

2. ASSUMPTIONS AND GROUND RULES

2.1 General.

Although still under development, the avionics is expected to include between 50% and 55% plug in circuit boards and 40% throwaway circuit chips The maintenance manning, reliability, maintainability, and material/spare consumption figures reflect this changing technology

The earlier program review was predicated on the assumption of a high level of embedded wiring in FA-X. In manufacturing the prototype aircraft it was found that embedded wiring was not practical, therefore,

GUIDANCE: INCLUDE A GENERAL DESCRIPTION OF SYSTEM CHANGES AND DISCUSS THEIR ANTICIPATED IMPACTS ON O&S COSTS INDICATING THE DEGREE OF CONFIDENCE THAT THE CHANGES ARE PRACTICAL AND COST IMPACTS ARE ACCURATE.

2.2 Baseline System.

As in the DSARC I report, the A-7E weapon system is used as the reference system. However, the data base was updated to include the latest year's data. The mission profile of the A-7E most closely resemble that of the F/A-X

GUIDANCE: IDENTIFY THE BASELINE SYSTEM AND EXPLAIN THE RATIONALE USED IN ITS SELECTION. IF THE BASELINE SYSTEM WAS CHANGED FROM DSARC I EXPLAIN FULLY WHY THE CHANGE WAS NECESSARY.

2.3 System and Program Characteristics.

Table 4 illustrates aircraft and program characteristics of the alternatives

GUIDANCE: INCLUDE DETAILS OF THE ALTERNATIVE SYSTEM.

TABLE 4. SYSTEM CHARACTERISTICS, ADVANCED F/A-X
(Typical)

Mission: Fighter/Attack with Recon Secondary

Range: 600-700 NM radius - Fighter/Recon: over 500 NM radius-Attack
(with auxiliary tanks)

Payload: All conventional fighter and attack weapons with an excess of
6000 lbs total combat load. All airborne, special weapons of
appropriate weight.

Speed: Over Mach 1.5 at 40,000 ft.

Carrier Suitability: Suitable for operations from large or small carriers
with or without catapult assist.

Operational Life: 1988-2000

Crew: 1

Squadron PAA: 12 acft

Deployments: (Listed in deployment priority other than Research and
Development (R&D))

1 FRS Sqdn (12 PAA) - West Coast
2 Fleet Sqdn (12 PAA) - Pacific
2 Fleet Sqdn (12 PAA) - Atlantic
*0 Fleet Sqdn (12 PAA) - West Coast
2 Fleet Sqdn (12 PAA) - Pacific
2 Fleet Sqdn (12 PAA) - Atlantic
2 Fleet Sqdn (12 PAA) - Pacific
2 Fleet Sqdn (12 PAA) - Atlantic

Total Operating Aircraft - 168

* Acft added to FRS to bring PAA to required 24.

2.4 Assumptions, Model Inputs, And Rates.

2.4.1 Design Sensitive Values. Table 5 lists the elements that are design-related

TABLE 5. DESIGN SENSITIVE VALUES				
<u>Elements</u>	<u>Values</u>	<u>Source</u>	<u>OPR</u>	<u>Ext</u>
1. Unit Production Costs	\$10M	PM Projection	Jim Smith	75124
2. Portion of Flyaway Costs for Material	53%	Contractor Estimate	Jim Smith	75124
3. AMPR Weight	16,400 lbs	PM Projection	John Doe	73124
4. Avionics Weight	2,890 lbs	PM Projection	John Doe	73124
5. Fuel Consumption	785 gal/hr	See paragraph 3.3	John Doe	73124
6. Mean Flight Hours Between Failures	1.67 hours	See table 9	John Doe	73124
7. Mean Flight Hours Between Unscheduled M (MFHBUMA)
8. SDLM Costs	\$350K/acft

2.4.1.1 Unit Production Costs.

The prototype manufacturing costs was compared with the prototype manufacturing costs of recent aircraft acquisitions and F/A-X unit production costs projected based on other unit production costs

2.4.1.2 Portion of Flyaway Costs for Material

2.4.1.8

GUIDANCE: DIVIDE VALUES USED IN THE COST ESTIMATING MODEL OR ALGORITHMS INTO TABLES DEPENDING ON THE NATURE OF THE PARAMETER INVOLVED. TABLE 5 CONTAINS ELEMENTS WHICH ARE INHERENT TO THE SYSTEM DESIGN AND ARE DEPENDENT ON HARDWARE CONFIGURATION. FOLLOWING THIS TABLE IS A BRIEF EXPLANATION OF THE DERIVATION OF THE VALUE SELECTED FOR THE PARAMETER.

2.4.2 System Operational Standards.

Table 6 identifies the values used in this analysis which reflect current Navy policy

TABLE 6. SYSTEM OPERATIONAL STANDARDS				
<u>Element</u>	<u>Value</u>	<u>Source</u>	<u>OPR</u>	<u>Ext</u>
1. Utilization Rate	27 hr/mo	PM Projection	John Doe	73124
2. Acft per Sqdn	12 acft	PM Projection	John Doe	73124
3. Attrition Rate	4.5%/acft/yr	OP-512	John Doaks	77111
4. Pipeline Rate	8.4% ops acft	OPNAVINST 3110.11K	Joe Doaks	77111
5. SDLM Interval	60 mo	OP-508	Jack Smith	78192
6. SDLM Duration	5.5 mo	OP-508	Jack Smith	78192
7. Crew Ratio	1.5	PM Projection	John Doe	73124

2.4.2.1 Utilization Rate.

The F/A-X will require about the same flying hours as the A-7E to support the training The use of flight simulation will

2.4.2.2 Aircraft per Squadron.

The Air Wing Composition Study (adopted as CNO policy) established Navy VF units at 12 PAA per squadron

2.4.2.3 Attrition Rate.

2.4.2.7 Crew Ratio.

The F/A-X will be an all weather day/night aircraft. In order to support this multi-role weapon system, it will require a crew ratio of

GUIDANCE: LIST THOSE FACTORS ESTABLISHED BY THE USING COMMAND WHICH IMPACT O&S COSTS IN A TABLE. A BRIEF EXPLANATION AND DERIVATION OF THE VALUE SHOWN FOLLOWS THE TABLE.

2.1.2 Standard Values and Rates.

Table 7 lists the standard values and rates used and the source

TABLE 7. STANDARD VALUES AND RATES				
<u>Element</u>	<u>Value</u>	<u>Source</u>	<u>OPR</u>	<u>Ext</u>
1. POL Costs	\$1.50/Gal	OPNAV-51C1	Mary Doe	51234
2. Officer Standard Composite Rate	\$27,000	ASD (COMP) Memo	-	-
3. Enlisted Standard Composite Rate	\$11,500	ASD (COMP) Memo	-	-
4. Acft Service Life	15 years	ASD (COMP)	-	-
5. Escalation Factors	variable	ASD (COMP)	-	-
6. Base Year Dollars	FY 80	CAIG	Tom Mix	75631

GUIDANCE: HIGHLIGHT THOSE STANDARD VALUES WHICH ARE ESTABLISHED AND GENERALLY ACCEPTED IN A TABLE. THESE VALUES ARE NOT SUBJECT TO INFLUENCE BY THE SYSTEM UNDER CONSIDERATION OR THE USING COMMAND.

3. METHODOLOGY

3.1 General.

For this analysis the Navy O&S Cost estimating model was used. A summary of this model is provided in Appendix C

GUIDANCE: IF A GENERALLY APPLICABLE COMPUTERIZED COST ESTIMATING MODEL IS USED FOR THE ANALYSIS INSTEAD OF THE SERIES OF ALGORITHMS LISTED IN APPENDIX B OF THIS REPORT, INCLUDE SUMMARY OF THE MODEL USED, AS WELL AS APPROPRIATE COMPUTER PRODUCTS, IN APPENDIX C OF THE REPORT AND OMIT APPENDIX B.

3.2 Data Sources .

The sources used in defining the baseline costs and the method used in estimating the proposed system's cost are listed in Table 8 for each of the cost elements

GUIDANCE: INCLUDE A MATRIX OF SOURCES AND METHODS IN THE REPORT.

3.3 Derivation of Scalars.

In applying the baseline data to the F/A-X and projecting costs it was necessary to establish a proportional relationship between the two systems. These proportions are explained in the following paragraphs.

GUIDANCE: ESTABLISH SOME PROPORTIONAL RELATIONSHIP BETWEEN THE BASELINE SYSTEM AND THE ALTERNATIVES WHEN COST ANALYSIS DATA IS NOT DIRECTLY AVAILABLE FROM THE WEAPON SYSTEM UNDER CONSIDERATION. THIS RELATIONSHIP IS THEN USED TO SCALE THE BASELINE COSTS TO DETERMINE THE ESTIMATED COSTS OF THE ALTERNATIVE SYSTEMS.

3.3.1 Reliability and Maintainability.

In consonance with the level of detail available on this program, Reliability and Maintainability (R&M) data is provided to the two digit Work Unit Code (WUC) levels in Table 9....

3.3.1.1 Airframe.

The F/A-X is composed of 73% composite material. This is expected to greatly increase the reliability of airframe components; however, each failure must be expected to require more manhours to repair than current alloys. The increased DMMH per failure will be more than offset by the increased reliability, thereby reducing the DMMH/FH

3.3.1.2 Fuselage. See paragraph 3.3.1.1 above.

GUIDANCE: DATA FOR THE BASELINE SYSTEM IS USUALLY AVAILABLE TO THE FIVE DIGIT WORK UNIT CODE BREAKOUT, HOWEVER, IT MAY NOT BE AVAILABLE ON THE ALTERNATIVE SYSTEM, OR THE FIVE DIGIT LEVEL OF DETAIL MAY NOT BE APPROPRIATE/SIGNIFICANT. THEREFORE, THE DATA SHOULD BE CONSOLIDATED TO A SIGNIFICANT LEVEL OF DETAIL. THE RATIONALE USED IN DEVELOPING THE WUC SCALARS SHOULD BE BRIEFLY EXPLAINED.

TABLE 8. DATA SOURCES AND METHODOLOGY

Cost Element	A-7E BASELINE		F/A-X ALTERNATIVE SYSTEM	
	Source	Method Existing Data:	Source	Method
UNIT MISSION PERS	OPNAV 10-P35:ASD (COMF) MEMO Jan 30, 1979	Normalized to a Sq/Yr	Manpower Analysis: ASD (COMF) Memorandum, Jan 30, 1979	See Appendix A
UNIT LEVEL CONSUMPTION POL	NAVAIR INST C10340.26	Normalized to a Sq/Yr	Program Manager	Normalized to a Sq/Yr
Maint Material	VANOSC-AIR MS Rpt (FY 78)	Normalized to a Cost/ FH	Baseline	Scaled by flyaway costs and DMSH/FH
Trng Ordnance	VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Cost/ FH	Baseline	Scaled by number of crews in sqdn
DEPOT LEVEL MAINT Airframe Rework	VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Sq/Yr	Program Manager	Scaled by SOLN interval
Engine Rework	OPNAV-90P-02B	Normalized to a Sq/Yr	Baseline	Scaled by reliability of engines
Component Repair	VANOSC-AIR MS Rpt	Normalized to a sub- system Cost/FH	Baseline	Scaled by flyaway costs, reliability, and design impact
Support Equipment Software Modifications Other Depot	Program Manager N/A See Modification Kits VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Cost/ FH	Program Manager Program Manager See Modifications Kits Baseline	Scaled by depot Air- frame Engine and component repair
Contracted Unit Level Spt	N/A		N/A	
SUSTAINING INVESTMENT Repairable Spares	VANOSC-AIR MS Rpt (FY 78)	Normalized to a sub- system Cost/FH	Baseline	Scaled by flyaway cost, reliability, and design impact of each subsystem
Replacement Spt Equip	Program Manager	Normalized to a Cost/ acft	Baseline	Scaled by flyaway costs
Modification Kits	VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Cost/ FH	Baseline	Baseline figures used
Other Recurring Inv	N/A		N/A	
INSTALLATION SPT PERS Base Op Spt	OPNAV-90P-02B (FY 78)	Normalized to a Sq/Yr	Baseline	Scaled by total sqdn population
Real Prop Mgmt Medical	See Base Op Spt OPNAV-90P-02B (FY 78)	Normalized to a Sq/Yr	See Base Op Spt Baseline	Scaled by total sqdn population
INDIRECT PERS SPT Misc Op & Maint	Not Available		Not Available	
Medical OCN (Non-Pay)	OPNAV-90P-02B (FY 78)	Normalized to a Cost/ acft	Baseline	Scaled by total sqdn population
PCS	OPNAV-90P-02B (FY 78)	Normalized to a Cost/ acft	Baseline	Scaled by total sqdn population
Temp Add Duty Pay	VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Cost/ acft	Baseline	Scaled by sqdn enlisted population
DEPOT NON-MAINT General Depot Spt	VANOSC-AIR TSS Rpt (FY 78)	Normalized to a Cost/ FH	Baseline	Scaled by total depot costs
Second Dest Trans	Not Available		Not Available	
PERS. ACQUISITION & TRNG Acquisition	OPNAV-90P-02B (FY 78)	Normalized to a Cost/ acft	Baseline	Scaled by total sqdn population
Individual Trng	OPNAV-90P-02B (FY 78)	Normalized to a Cost/ acft	Baseline	Scaled by total sqdn population

TABLE 9. RELIABILITY AND MAINTAINABILITY ANALYSIS

WUC	ELEMENT	Reliability (MFHBF)			Maintainability (DMMH/FH)		
		A-7E	F/A-X	SCALAR	A-7E	F/A-X	SCALAR
11	Airframe	14.0	50	.28	1.19	.75	.63
12	Fuselage	38.3	75	.51	.20	.13	.65
13	Landing Gear	11.0	15	.73	.91	.58	.64
14	Flight Control	28.7	30	.96	.71	.45	.63
23,29	Engines & Installation	25.5	12.8	1.99	1.34	1.65	1.23
41	Air Cond/Pres	51.7	51.7	1.00	.24	.24	1.00
42	Electrical Systems	23.1	35	.68	.50	.36	.72
44	Lighting Systems	22.6	30	.75	.20	.15	.67
45	Hydraulic/Pneumatic	45.4	35	1.30	.22	.14	.64
46	Fuel Systems	48.9	35	1.40	.35	.23	.66
47	Oxygen Systems	138.9	138.9	1.00	.03	.03	1.00
49	Misc Utilities	159.1	200	.80	.08	.05	.63
511	ACFT Systems Instruments	18.1	35	.52	.37	.25	.68
512	Nav Instruments	249.9	350	.71	.04	.03	.75
56	FLT Reference	365.4	500	.73	.03	.02	.67
57	Integrated Guidance	22.5	30	.75	.53	.37	.70
63	UHF Comm	20.5	30	.68	.43	.30	.70
64,65,66,							
67	Misc Comm	60.4	70	.86	.15	.10	.67
71	Radio Nav	28.2	50	.56	.46	.32	.70
72	Radar Nav	59.4	75	.79	.19	.13	.68
73	Bomb Nav (other)	66.4	70	.95	.19	.13	.68
73A	Bomb Nav Radar	7.7	30	.26	2.29	1.59	.69
74	Weapons Control	57.5	75	.77	.21	.14	.67
75	Weapons Delivery	35.0	35	1.00	.44	.44	1.00
76,77	ECM & Photo	48.9	48.9	1.00	.36	.36	1.00
91,96,97	Personal Equipment System	221.5	221.5	1.00	.04	.04	1.00
		1.15	1.67		11.70	8.98	

3.3.2 Material Costs Scalar.

The material cost scalar of the F/A-X system is 2. Derivation follows:

a. A-7E Procurement: (In Millions)

Year	Costs			Qty	Unit Flyaway Cost (FY80\$)
	Actual	Escalation Rates	FY80\$		
1970	73.4	2.30	168.8	27	6.25
1971	76.5	2.17	166.0	30	5.54
...
1977	222.3	1.22	271.2	30	9.04
1978	238.0	1.13	268.9	30	8.96
Average Unit Flyaway Costs = \$6.71					

b. Labor portion of flyaway costs is not scaled.

c. Material Costs

- (1) A-7E = 38% of flyaway costs
 = $.38 \times 6.71 = \$2.55M$

Percentage is based on contractor documentation, available from (list Project Officer, Office symbol, extension).

- (2) F/A-X System = \$10M = Flyaway Costs (assumed)

The increase in flyaway costs is due to historical cost trends, increased performance requirements, use of advanced technology, and increase in the percentage of overhead due to lower production rates.

Material Costs = 53% of flyaway
 = $.53 \times 10. = \$5.3M$

The increase in percentage of flyaway costs is based on the use of expensive composite material in the air frame and the use of micro-electronics.

d. Material Cost Scalar

- = $F/A-X \text{ System Mat} \div A-7E \text{ Mat}$
 = $\$5.3 \div \2.55
 = 2

GUIDANCE: MANY OF THE ALTERNATIVE SYSTEM O&S COSTS WHICH CANNOT BE OBTAINED DIRECTLY MAY BE ESTIMATED BY DETERMINING THEIR RELATIONSHIP TO THE TOTAL COSTS OF THE BASELINE SYSTEM. REPLENISHMENT SPARES AND COMPONENT REPAIR ARE BUT TWO EXAMPLES OF SUCH COSTS. THEREFORE, IT IS OFTEN HELPFUL TO ESTABLISH A RELATIONSHIP BETWEEN THE BASELINE COSTS AND THE ESTIMATE OF THE ALTERNATIVE SYSTEM'S FACTORS COSTS.

3.3.3. Design/Environment Impact.

Based on a study of maintenance actions covering fighter/attack aircraft, subject: . . . dated . . . , it was found that 78% of the structural failures could have been avoided by redesign . . . as such, the assumption is made that . . . is the applicable factors

GUIDANCE: WHEN APPLYING ESTIMATING FACTORS TO A GIVEN COST, THAT COST CAN SOMETIMES BE SEPARATED INTO TWO PARTS: THOSE WHICH ARE RELATED TO THE DESIGN OF THE COMPONENT IN QUESTION AND THOSE WHICH ARE CONSTANT. INDUCED FAILURES, FALSE REMOVALS, STORAGE AND HANDLING LOSSES ARE EXAMPLES OF CONSTANT COSTS WHICH ARE NOT DIRECTLY DESIGN-RELATED AND SHOULD NOT BE FACTORED INTO THE COST ESTIMATE.

3.3.4 Support Equipment.

A review of support equipment purchased in support of fighter/attack aircraft indicates that on an average, .218% of flyaway costs is required for annual equipment replenishment and 4.2% of replenishment costs is expended for depot repair. The anticipated design and maintenance concept changes are expected to shift the emphasis from Organization (O) level to Intermediate (I) level, however these changes should be offsetting. Therefore, the proportions were assumed not to change for this analysis.

GUIDANCE: MAKE AVAILABLE IN THE PENTAGON STUDIES WHICH SUPPORT THE ASSUMPTIONS OF THIS TYPE, BUT WHICH ARE NOT PART OF THE REPORT.

3.4 POL Consumption.

There are four basic mission profiles anticipated for the F/A-X. They are as follows Table 10 reflects the approximate percentage for each type sortie and the Petroleum, Oils, and Lubricants (POL) consumptions rates

TABLE 10. POL CONSUMPTION

<u>Mission</u>	<u>Total, Sorties</u>	<u>Duration</u>	<u>POL</u>	<u>POL/FH</u>
A	10%	4.0 hr	3050 gal	762.5 gal/FH
B	20%	2.5 hr	1950 gal	780 gal/FH
C	40%	1.0 hr	810 gal	810 gal/FH
D	30%	1.5%	1185 gal	790 gal/FH

Average Sortie Duration

A	10%	x	4.0 hr	=	0.4 hr
B	20%	x	2.5 hr	=	0.5 hr
C	40%	x	1.0 hr	=	0.4 hr
D	30%	x	1.5 hr	=	0.45 hr
Average				=	1.75 hr

% of Total Fly Hours

A	0.4 hr	÷	1.75 hr	=	22.9%
B	0.5 hr	÷	1.75 hr	=	28.5%
C	0.4 hr	÷	1.75 hr	=	22.9%
D	0.45 hr	÷	1.75 hr	=	25.7%

Contribution to Average POL Consumption

A	22.9 %	x	762.5 gal	=	174.6 gal
B	28.5 %	x	780 gal	=	222.3 gal
C	22.9 %	x	810 gal	=	185.5 gal
D	25.7 %	x	790 gal	=	203.0 gal
Total				=	785.4 gal/FH

GUIDANCE: WHEN THE DERIVATION OF A VALUE USED IN THE COST ANALYSIS IS COMPLEX, PROVIDE A DETAILED EXPLANATION.

1. SENSITIVITY/RISK ANALYSIS

Although the F/A-X system is still undergoing development, there is sufficient detail known to establish fairly accurate predictions. This coupled with a well-established and accurate data base provides a credible basis for the estimations

GUIDANCE: INCLUDE AN INDICATION OF THE CONFIDENCE IN THE FIGURES PRESENTED.

4.1 General.

Airframe Rework, Reliability and POL appear to present the greatest risk potential

GUIDANCE: DEVELOP A FURTHER, DETAILED ANALYSIS OF THE COST IMPACT OF EACH COST ELEMENT OFFERING A POTENTIAL FOR HIGH COSTS, ESPECIALLY THOSE OF WHICH THE VALUE ESTIMATED FOR THE O&S COST ANALYSIS COULD VARY WIDELY. IDENTIFY THE RANGE OF VALUES SELECTED FOR SENSITIVITY ANALYSIS AND THE RATIONALE FOR SELECTION. PRESENT THE RESULTS USING IDENTICAL GRAPHICAL VALUES WHENEVER POSSIBLE TO FACILITATE A COMPARISON.

4.2 Airframe Rework.

Scheduled Depot Level Maintenance (SDLM) costs were developed by the contractor using

. . . The estimates were then compared with current aircraft rework costs with the following results:

<u>Acft</u>	<u>Costs Per SDLM</u>
F-14A	\$633.24 K
F-4N	409.73 K
F/A-X	\$350.00 K
A-6E	\$284.34 K
F-4J/S	\$264.54 K
F-18	\$239.47 K
F-5E/F	\$149.97 K
A-7E	\$128.57 K
A-4E	\$120.54 K
A-4F	\$116.03 K

Although there is little data on depot maintenance of aircraft with a high percentage of composite material, the estimate appears

The \$650 K per SDLM high value and \$240 K low value were selected for their sensitivity analysis because

	<u>SDLM Cost Range</u>		
Cost/SDLM	\$240 K	\$350 K	\$650 K
Annual Cost/Sqdn difference	-\$264 K	0	+\$720 K

4.3 Reliability.

The range of reliability values was based on a review of the potential of each subsystem . . . Table 11 identifies the high potential and low values for each subsystem's reliability

TABLE 11. RELIABILITY SENSITIVITY

<u>Work Unit Code</u>	<u>Mean Flying Hours Between Failures</u>		
	<u>Low Hours</u>	<u>Expected Hours</u>	<u>High Hours</u>
11	14	50	80
12	39	75	100
13	11	15	16
14	29	30	40
23, 29	12.8	12.8	25.5
41	51.7	51.7	75
42	23	35	50
44	23	30	35
45	45	35	50
46	49	35	49
47	139	139	150
49	159	200	210
511	18	35	50
512	250	350	400
56	365	500	510
57	23	30	35
63	21	30	40
64, 65, 66, 67	61	70	80
71	28	30	60
72	59	75	95
73	66	70	75
73A	8	30	33
74	58	75	80
75	35	35	38
76, 77	49	49	49
91, 96, 97	222	222	222
System	1.12	1.60	2.05

Cost Delta

	<u>Low Hours</u>	<u>Expected</u>	<u>High Hours</u>
Maint Material	+ 154	-	-78
Component Rework	+ 135	-	-86
Other Depot	+ 31	-	-20
Reparable Spares	+ 45	-	-29
General Depot Spt	+ 5	-	- 3
Total	+\$370K	-	-\$216K

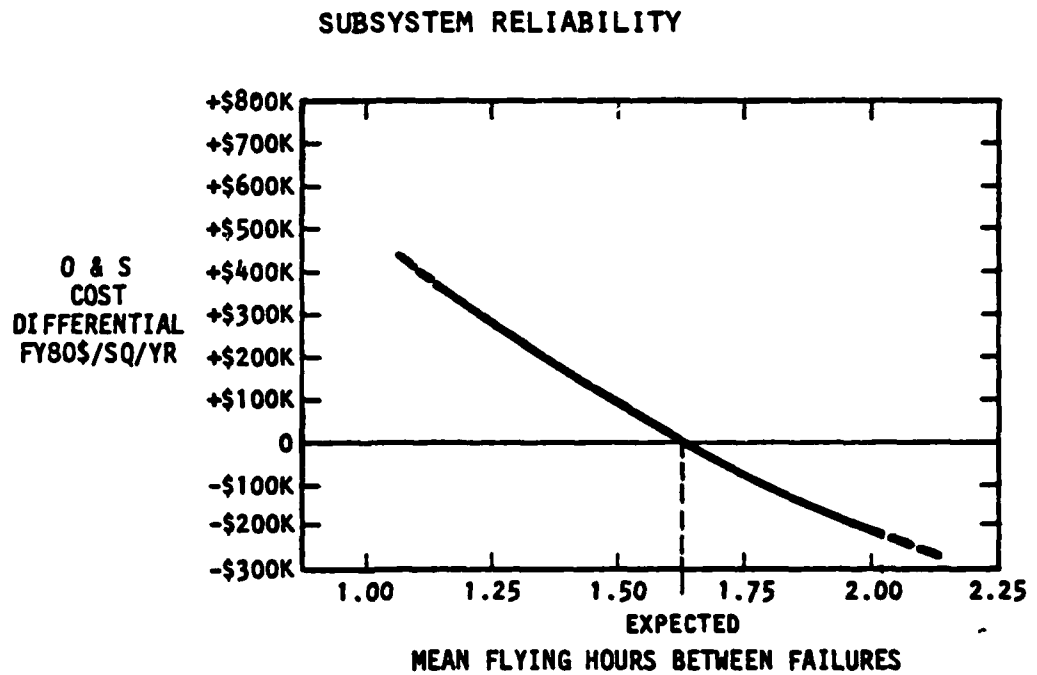
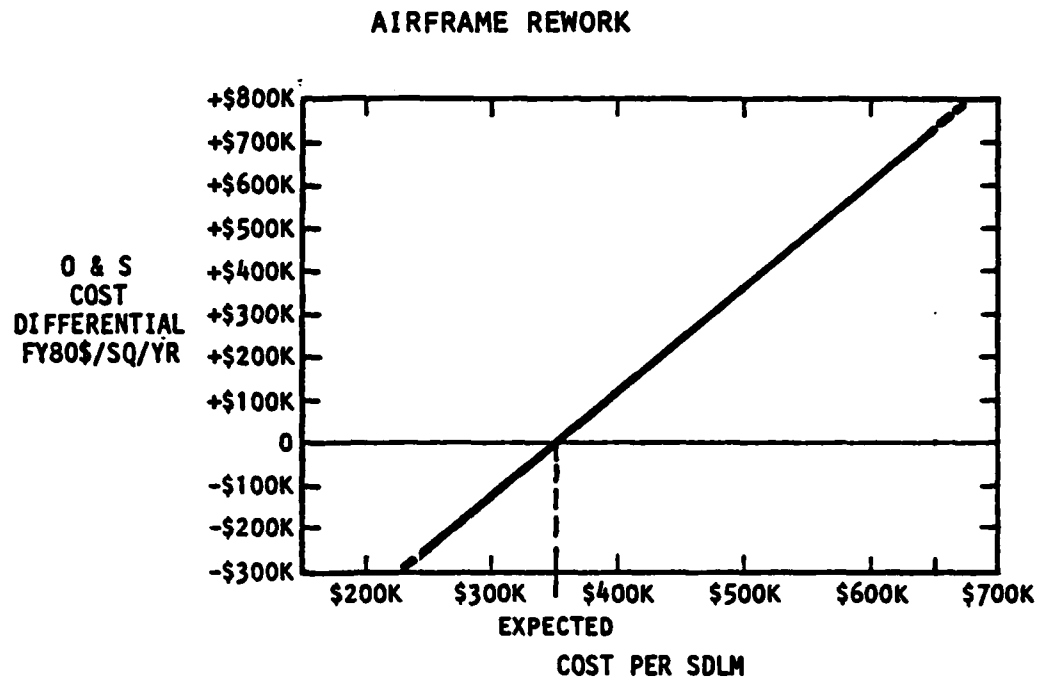


FIGURE 2. SENSITIVITY GRAPHS

A A POL Sensitivity.

There are two areas of risk associated with POL costs: the uncertainty of unit costs and the fuel consumption rate of a new weapon system To place the F/A-X system in the proper perspective, other comparable Naval weapon systems are shown in Figure 3 (Figures are taken from NAVAIRINST C10340.2C (C) and based on 324 FH/PAA/YR.)

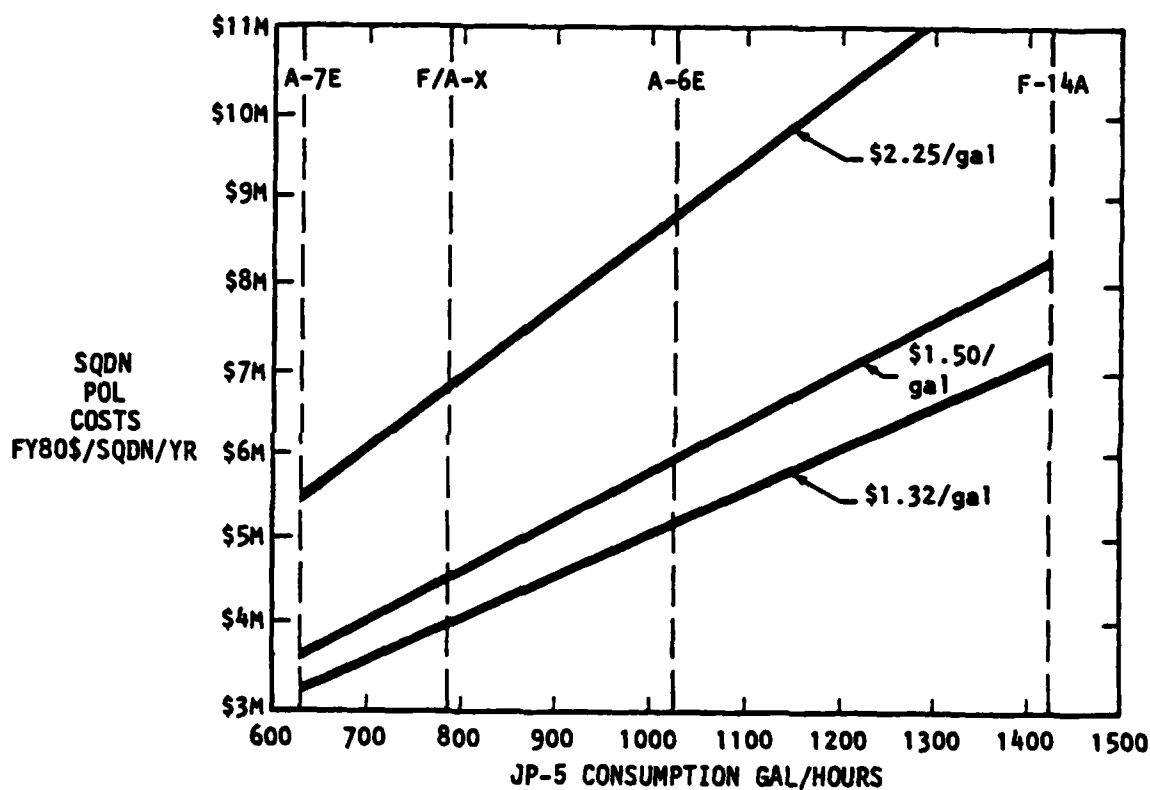


Figure 3. POL Sensitivity Graph

5. SUMMARY

Still to be resolved are the methods of determining and prorating Miscellaneous Operations and Maintenance and Second Destination Transportation Costs. It is anticipated that these methods will be developed and values for these indirect categories provided at the Milestone III review.

GUIDANCE: NOTE ISSUES LEFT UNRESOLVED OR THOSE WHICH WILL RECEIVE CLOSE SCRUTINY IN THE FUTURE.

As the system is refined and more operational experience is obtained, test data will be used to predict mature system support costs. This will be especially evident in the reliability and maintainability cost estimations

GUIDANCE: IDENTIFY ANTICIPATED REFINEMENTS AND NEW APPROACHES TO THE COST ESTIMATING TECHNIQUES.

APPENDIX A. UNIT MISSION PERSONNEL

Table A.1 provides a summary of A-7E and F/A-X
unit mission personnel

A.1 Crew Members.

The F/A-X will be a single seat aircraft. It is planned to have 18 aircrews to a 12 PAA squadron. The probable use of integrated avionics and automatic features of the alternative systems will tend to improve pilot fatigue tolerance in this aircraft

Further, a design that focuses on greater flexibility and quicker turnaround time will allow for increased aircraft and crew utilization. It is expected that this will equate to a slight decrease in the crew ratio to aircraft sortie under combat conditions

GUIDANCE: EXPLAIN THE RATIONALE BEHIND MANNING CHANGES TO THE BASELINE SYSTEM. WHEN THE ALTERNATIVE SYSTEM INCORPORATES NEW CONCEPTS OR A RADICAL DEPARTURE FROM EXISTING SYSTEMS/METHODS, EXPLAIN IN DETAIL THE CHANGE AND ITS EXPECTED IMPACT ON MANNING.

A.2 Maintenance.

A.2.1 Overview.

Trends indicate that advanced system ILS planning will include

GUIDANCE: INCLUDE A DETAILED NARRATION OF FACTORS THAT IMPINGE ON MAINTENANCE MANNING AS A WHOLE, SUCH AS CAPACITY OF FACILITIES, THROWAWAY VS. REPAIR IMPACT, AND MAINTENANCE CONCEPT.

A.2.2 Organizational Maintenance.

A 20% decrease in overall supervision is a reflection of the general trend to decrease maintenance manning

The expected 26% decrease in maintenance technicians at the Organizational level could be due to the use of composite materials and integrated electronics with alternate path circuitry. These changes should be expected to

A.2.3 Intermediate Maintenance.

The manpower requirements for Intermediate maintenance reflect a shift in expected workloads. While the workloads in airframe and electrical repair should decrease, avionics complexity should be expected to increase. The need for a more complex test equipment package will

The anticipated use of socket-mounted components, throwaway circuit boards, and automatic test equipment has been shown to facilities the fault finding actions and repair time

A.3 Integrated Service.

The accordance with standard Navy methodology manning of this function is calculated as 15% of the other squadron members to be supported. The five positions are a reflection of the overall reduction in squadron manning

GUIDANCE: INCLUDE REASONS FOR EACH CHANGE IN MANNING TO THE LEVEL OF DETAIL KNOWN.

TABLE A.1 UNIT MISSION PERSONNEL

	<u>A-7E Baseline</u>		<u>F/A-X Alternative</u>	
Total Aircrews	19		18	
Total Officers	23		20	
Total Enlisted	254		203	
Total Civilian	0		0	
	<u>Off</u>	<u>Enl</u>	<u>Off</u>	<u>Enl</u>
Squadron				
Exec	2	7	2	7
Administrative	3	13	2	14
Operations	6(1)	4	6(1)	4
Safety	2	1	2	1
Maintenance	6(3)	175	6(1)	124
Int Services	0	26	0	21
AIMD	0	28	0	32
Maintenance	6(3)	175	6(1)	124
General	2	0	1	0
Maint Control	(1)	7	1	5
Administration		1		1
Quality Control		8		5
Mat Control		8		4
Data Analysis		1		1
A/C OMNT Ac	1	1	1	1
Power Plant		13		16
A/F Branch	1	18	1	9
Corros Control		9		5
Avtr Equip Maint		4		4
Safety Equipment		7		5
Planned Maint		2		1
A/C OMNT Ar/Arm	1	1	1	1
Elec Branch		11		8
Fire Control		14		9
Elect/Instruments		12		8
Arm Branch	(1)	26	1	16
Line Division	(1)	1	(1)	1
Plane Captains		27		20
Trouble shooters		6		4
AIMD	0	28	0	32
Power Plant		4		4
Elect/Inst Repair		5		7
Hyd		1		1
Airframe		2		1
Arm		2		3
Fire Control		5		8
Elect		8		5
Survival		1		-
PMEL		0		3

Note: () - Non-Rated

APPENDIX B. MATHEMATICAL COMPUTATIONS

(All results in Thousands)

GUIDANCE: PROVIDE THE MATHEMATICAL COMPUTATIONS AND FORMULAS/ALGORITHMS USED TO CALCULATE THE COST ELEMENTS, DO NOT DUPLICATE COMPUTATIONS PERFORMED IN MECHANIZED (COMPUTERIZED) MODELS DESCRIBED IN APPENDIX C.

A-7E BASELINE

F/A-X

UNIT MISSION PERSONNEL

Aircrew

Aircrew x rate = off costs
 $19 \times \$27,000 = \513K/sq/yr
 $\$42.8\text{K/acft/yr}$

Aircrew x rate = off costs
 $18 \times \$27,000 = \486K/sq/yr
 $\$40.5\text{K/acft/yr}$

Maintenance

Maint off x rate = Maint off costs
 $3 \times \$27,000 = \81K/sq/yr
 Maint enl x rate = Maint enl costs
 $203 \times \$11,500 = \2344K/sq/yr
 Maint off + Maint enl = Tot. Maint Costs
 $\$81 + \$2344 = \$2415\text{K/sq/yr}$
 $\$201.3\text{K/acft/yr}$

Maint off x rate = Maint off costs
 $1 \times \$27,000 = \27K/sq/yr
 Maint enl x rate = Maint enl costs
 $156 \times \$11,500 = \$1,794\text{K/sq/yr}$
 Maint off + Maint enl = Tot. Maint
 $\$27 + \$1,794 = \$1,821\text{K/sq/yr}$
 $\$151.8\text{K/acft/yr}$

Other Unit Personnel

off x rate = off costs
 $1 \times \$27,000 = \27K/sq/yr
 enl x rate = enl costs
 $51 \times \$11,500 = \587K/sq/yr
 off + enl = total costs
 $\$27 + \$587 = \$614\text{K/sq/yr}$
 $\$51.2\text{K/acft/yr}$

off x rate = off costs
 $1 \times \$27,000 = \27K/sq/yr
 enl x rate = enl costs
 $47 \times \$11,500 = \541K/sq/yr
 off + enl = total costs
 $\$27 + \$541 = \$568\text{K/sq/yr}$
 $\$47.3\text{K/acft/yr}$

UNIT LEVEL CONSUMPTION

POL

Consumption rate x POL costs
 x Flying hours = sq costs
 $623.9 \text{ Gal/hr} \times \1.50 per gal
 $\times 324\text{FH}^* = \303.2K/acft/yr
 $\$303.2 \times 12 \text{ acft} = \3639K/sq/yr

Consumption rate x POL costs
 x Flying hours = sq costs
 $785 \text{ Gal/hr} \times \1.50 per gal
 $\times 324\text{FH} = \$381.5\text{K/acft/yr}$
 $\$381.5 \times 12 \text{ acft} = \4578K/sq/yr

* Annual Flying Hours Program
 $27\text{FH/mo/acft} \times 12 \text{ mo} = 324\text{FH/acft/yr}$
 $324\text{FH} \times 12 \text{ acft} = 3888\text{FH/sqdn/yr}$

Maintenance Material:

A-7E BASELINE

WUC	O Level scheduled	O Level unsch.	I Level	O&I unsched.	O&I unsched. \$/FH
11	\$216 K	\$966 K	\$37 K	\$1003 K	\$ 6.68
12	35	341	50	391	2.60
13	213	1154	209	1363	9.08
14	42	273	194	467	3.11
23,29	24	153	242	395	2.63
41	24	274	62	336	2.24
42	31	432	30	462	1.08
44	17	287	28	315	2.10
45	25	191	86	277	1.84
46	20	302	23	324	2.16
47	1	21	3	30	0.20
49	6	42	1	43	0.29
511	6	87	77	164	1.09
512	3	68	3	71	0.47
56	2	24	0	24	0.16
57	2	86	257	343	2.28
63	8	92	72	164	1.09
64,65,66,67	8	143	72	420	2.80
71	8	143	258	393	2.62
72	7	112	72	184	1.23
73	1	28	152	160	1.07
73A	24	373	1314	1687	11.23
74	10	89	40	129	0.86
75	18	170	34	204	1.36
76,77	20	186	272	458	3.05
81,96,97	9	79	8	87	0.58
Total	\$ 776 K	\$ 6316 K	\$ 3578 K	\$ 9894 K	\$65.87
\$/FH	\$5.17	\$42.05	\$23.82		

Pre-expensed Material = \$33.88/FH

Personal Support = \$46.08/FH

Grand Total = O scheduled + O&I unscheduled + Pre-expensed
+ Personal Support = \$5.17 + \$65.87 + \$33.88 +
\$46.08 = \$151.00/FH

\$151.00/FH x 324FH = \$48.9K/acft/yr

\$48.9 x 12 acft = \$587K/sq/yr

Maintenance Material: F/A-X

- [illegible]

A-7E BASELINE

F/A-X

Training Ordnance

Reported Costs x Escalation Factor =

Baseline Costs

$$\$5,852 \text{ (FY78)} \times 1.1555 = \$6763 \text{K (FY80)}$$

Total Costs ÷ no of Sqdns = Cost/Sqdn

$$\$6763 \div 28 = \$241\text{K/sq/yr}$$

Sq costs = (F/A-X crew ÷

Baseline crews) Baseline Costs

$$(18 \div 19) \$241 = \$228\text{K/sq/yr}$$

DEPOT LEVEL MAINTENANCE

Airframe Rework

$$\$17,176 \text{ (FY78)} \times 1.1555 = \$19,848 \text{ (FY80)}$$

$$\$19,848 \div 154,005 \text{ hrs} = \$128.88/\text{FH}$$

$$\$/\text{SDLM} \div \text{SDLM Interval} \times 12 \text{ mo} \\ = \text{/acft/yr}$$

$$\$350\text{K} \div 60 \text{ mo} \times 12 \text{ mo} = \$70\text{K/acft/yr}$$

$$\$70 \times 12 \text{ acft} =$$

$$\$128.88 \times 324\text{FH} = \$41.8\text{K/acft/yr}$$

$$\$41.8 \times 12 \text{ acft} = \$501\text{K/sq/yr}$$

Engine Rework

$$\$233/\text{FH} \text{ (FY79)} \times 1.0690 = \$249.08 \text{ (FY80)}$$

$$249.08/\text{FH} \times 324\text{FH} = \$80.7\text{K/acft/yr}$$

$$\$80.7 \times 12 \text{ acft} = \$968\text{K/sq/yr}$$

Costs = baseline x Eng reliability
scalar

$$\$249.08/\text{FH} \times 1.99 = 495.67/\text{FH}$$

$$\$495.67 \times 324\text{FH} = \$160.6\text{K/acft/yr}$$

$$\$160.6 \times 12 \text{ acft} = \$1926\text{K/sq/yr}$$

Component Rework: F/A-X

1. Airframe

a. Labor

Baseline x design controled x \bar{R} scalar = costs
\$322 x .78 x .28 = \$70
Baseline x environment controled = costs
\$322 x .22 = \$71
Total Labor = \$141

b. Material

Baseline x design controled x \bar{R} scalar x Material Cost scalar
\$61 x .78 x .28 x 2 = \$27
Baseline x environment controled x Material Cost scalar
\$61 x .22 x 2 = \$27
Total Material = \$27 + \$27 = \$54

c. Total Airframe = Labor costs + Material costs
= \$141 + \$54 = \$195

2. Fuselage

\$172 x .78 x .51 = \$68
172 x .22 x .51 = \$38
76 x .78 x .51 x 2 = \$60
76 x .22 x .51 x 2 = \$33
Total = \$199

.....

25. ECM & Photo

\$441 1.00 x 1 = \$441
\$158 1.00 x 1 = \$158
Total = \$599

26. Personal Equip

o
o

27. Total Costs

\$195 + \$199 + \$2144 + \$1794 + \$3467 + \$1928 + \$569 +
\$ 29 + \$714 + \$1332 + \$ 144 + \$ 154 + \$ 721 + \$361 +
\$ 53 + \$1296 + \$ 320 + \$ 58 + \$ 504 + \$ 520 + \$286 + \$3734 +
\$170 + \$1952 + \$ 599 + 0 = \$23244K

\$23244 ÷ 150192FH = \$154.76/FH
\$154.76 x 324FH = \$50.1K/acft/yr
\$50.1 x 12 acft = \$602K/sq/yr

A-7E BASELINE

F/A-X

Support Equipment Repair

(See replacement, Support Equip)

Replacement costs x repair factor
x sq acft = sq costs
 $\$15 \times 4.2\% = \0.63K/acft/yr
 $\$0.63 \times 12 \text{ acft} = \8K/sq/yr

Software

Not applicable

Modification

See Modification Kits

Other Depot

$\$16,177 \text{ (FY78)} \times 1.555 = \$18,694\text{K (FY80)}$ Baseline Costs x Alternative System

$\$18,694 \div 154005 \text{ hrs} = \$121.38/\text{FH}$

$121.38 \times 324\text{FH} = \39.3K/acft/yr

$\$39.3 \times 12 \text{ acft} = \472K/sq/yr

Contracted Unit Level Support

Not applicable

(See replacement, Support Equip)

Replacement costs x repair factor
x sq acft = sq costs
 $\$22 \times 4.2\% = \0.92K/acft/yr
 $\$0.92 \times 12 \text{ acft} = \11K/sq/yr

Contractor's preliminary estimate
 $\$100\text{K/sq/yr}$ (Based on 13 sqdns)

See Modification Kits

depot costs ÷ Baseline system

depot costs

$\$121.38/\text{FH} \times (3479 \div 2036) =$

$\$207.41/\text{FH}$

$\$207.41/\text{FH} \times 324\text{FH} = \67.2K/acft/yr

$\$67.2 \times 12 \text{ acft} = \806K/sq/yr

Undetermined at this time

SUSTAINING INVESTMENT

Reparable Spares:

A-7E BASELINE

	<u>I</u>	<u>Depot</u>		
<u>WUC</u>	<u>Condemn.</u>	<u>Condemn.</u>	<u>Total</u>	<u>\$/FH</u>
11	\$171 K	\$ 32K	\$ 203 K	1.35
12	16	47	63	0.42
13	565	670	1235	8.22
14	526	258	784	5.22
23,29	16	376	392	2.61
41	43	111	154	1.03
42	18	39	57	0.38
44	66	8	74	0.49
45	36	73	109	0.73
46	18	89	107	0.71
47	8	91	99	0.66
49	35	23	58	0.39
511	96	7	103	0.69
512	0	21	21	0.13
56	0	0	0	0
57	21	196	217	1.44
63	5	17	22	0.15
64,65,66,67	7	3	10	0.07
71	8	23	31	0.21
72	21	61	82	0.55
73	34	1	35	0.23
73A	321	315	636	4.23
74	10	27	37	0.24
75	45	176	221	1.47
76,77	51	98	149	0.99
91,96,97	92	13	105	0.70
Total	\$2229 K	\$ 2775K	\$ 5004 K	\$33.32

$$\$33.32/\text{FH} \times 324\text{FH} = \$10.8\text{K}/\text{acft}/\text{yr}$$
$$\$10.8 \times 12 \text{ acft} = \$130\text{K/sq/yr}$$

Reparable Spares: F/A-X

- ## 1. Airframe

Baseline x design controlled x \bar{R} scalar x Material Cost scalar

$$\$1.35 \times .78 \times .28 \times 2 = \$0.59$$

Baseline x environment controlled x Material Cost Scalar

$$\$1.35 \times .22 \times 2 = \$0.59$$

Total costs = design controlled cost + environment controlled costs

$$\$/FH = \$0.59 + \$0.59 = \$1.18/FH$$

- ## 2. Fuselage

$$\$0.42 \times .78 \times .51 \times 2 = \$0.33$$
$$0.42 \times .22 \times 2 = \$0.18$$

Total = \$0.51/FH

- ### 3. Landing Gear

$$\text{\$8.22} \times .78 \times .73 \times 2 = \text{\$9.36}$$
$$8.22 \times .22 \times 2 = \$3.62$$

Total = \$12.98/FH

• • • • •

26 Personal Equip

$$\$0.70 \times 1.00 \times 1.00 = \$0.70$$

$$\text{Total} = \$0.70/\text{FH}$$

$$\begin{aligned} 27. \text{ Total } & \$ 1.18 + \$0.51 + \$12.98 + \$10.12 + \$5.19 + \\ & \$ 1.03 + \$0.56 + \$ 0.79 + \$ 2.62 + \$1.86 + \$0.66 + \\ & \$ 0.66 + \$0.86 + \$ 0.20 + \$ 2.43 + \$0.24 + \$0.13 + \\ & \$ 0.30 + \$0.96 + \$ 0.44 + \$ 4.52 + \$0.41 + \$1.47 + \\ & \$ 0.99 + \$0.70 = \$51.81/\text{FH} \end{aligned}$$

$$\$51.81/\text{FH} \times 324\text{FH} = \$16.8\text{K}/\text{acft}/\text{yr}$$

$$\$16.8 \times 12 \text{ acft} = \$201\text{K}/\text{sq}/\text{yr}$$

A-7E BASELINE

F/A-X

Replacement Support Equipment

Spt Equip = Flyaway costs x replacement factor

$$\$6.71\text{M} \times .218\% = \$14.6\text{K}/\text{acft}/\text{yr}$$

$$\$14.6 \times 12 \text{ acft} = \$175\text{K}/\text{sq}/\text{yr}$$

Spt Equip = Flyaway costs x replacement factor

$$\$10\text{M} \times .218\% = \$21.8\text{K}/\text{acft}/\text{yr}$$

$$\$21.8 \times 12 \text{ acft} = \$262\text{K}/\text{sq}/\text{yr}$$

Modification Kits*

$$\$7515 (78) = \$8684 (80)$$

$$\$8684 \div 154,005\text{FH} = \$56.39/\text{FH}$$

$$\$56.39 \times 324\text{FH} = \$18.3\text{K}/\text{acft}/\text{yr}$$

$$\$18.3 \times 12 \text{ acft} = \$219\text{K}/\text{sq}/\text{yr}$$

Undetermined at this time.

Baseline figures are used to avoid distortion of the comparison.

*Includes engineering and initial support.

Other Recurring Investment

Not applicable

Not applicable

INSTALLATION SUPPORT PERSONNEL

BOS

$$\$11/\text{acft} (79) = \$11.7\text{K}(80)/\text{acft}/\text{yr}$$

$$11.7 \times 12 \text{ acft} = \$140\text{K}/\text{sq}/\text{yr}$$

Alternative = Baseline (Proposed

SQML \div Baseline SQML)

$$= \$11.7 \times (20 + 203) \div (23 + 254)$$

$$= \$11.7 \times .80505$$

$$= \$9.4\text{K}/\text{acft}/\text{yr}$$

$$= \$9.4 \times 12 \text{ acft} = \$113\text{K}/\text{sq}/\text{yr}$$

Real Property Management

Included in BOS

Included in BOS

A-7E BASELINE

F/A-X

Medical

.21 (officers) + .41 (enlisted) =
 .62 total
 $\$.62 (79) = \$.66K (80)/acft/yr$
 $\$.66 \times 12 \text{ acft} = \$8K/sqdn/yr$

Alternative = Baseline (Proposed SQML
 \div Baseline SQML)
 $= \$.66 \times .80505$
 $= \$.53K/acft/yr$
 $= \$.53 \times 12 \text{ acft} =$
 $\$6K/sq/yr$

INDIRECT PERSONNEL SUPPORT

Miscellaneous Operations & Maintenance

Cannot be determined at this time

Cannot be determined at this time

Medical O&M (Non-Pay)

$\$9/acft (79) = \$9.6K/acft/yr (80)$

$\$9.6 \times 12 \text{ acft} = \$115K/sqdn/yr$

Alternative = Baseline (Proposed
 \div Baseline SQML)
 $= \$9.6 \times .80505$
 $= \$7.7K/acft/yr$
 $= \$7.7 \times 12 \text{ acft} =$
 $\$93K/sq/yr$

PCS

$\$12/acft (79) = \$12.8K (80)/acft/yr$

$12.8 \times 12 \text{ acft} = \$154K/sqdn/yr$

Alternative = Baseline (Proposed SQML
 \div Baseline SQML)
 $= \$12.8 \times .80505$
 $= \$10.3K/acft/yr$
 $= \$10.3 \times 12 \text{ acft} =$
 $\$124K/sq/yr$

Temp Additional Duty Pay

$\$511 (78) = \$590.9 (80)$

$590.9 \div 261 \text{ acft} = \$2.3K/acft/yr$

$\$2.3 \times 12 \text{ acft} = \$27K/sq/yr$

Alternative = Baseline (Proposed
 enlisted pop. \div Base-
 line listed pop.)
 $= \$2.3 \times .79921$
 $= \$1.8K/acft/yr$
 $= \$1.8 \times 12 \text{ acft} =$
 $\$22K/sq/yr$

DEPOT NON-MAINTENANCE

General Depot

$\$2383 (78) = \$2753.7 (80)$

$2753.7 \div 154,005 \text{ FH} = \$17.88/FH$

$\$17.88 \times 324 \text{ FH} = \$5.8K/acft/yr$

$\$5.8 \times 12 \text{ acft} = \$70K/sq/yr$

Alternative = Baseline (Proposed
 Depot
 Maint & Sustaining Invest-
 ment \div Baseline Depot
 Maint & Sustaining
 Investment)
 $\$5.8 \times (\$4969 \div \$3032) =$
 $\$9.5K/acft/yr$
 $\$9.5 \times 12 \text{ acft} = \$114K/sq/yr$

A-7E BASELINE

F/A-X

Second Destination Transportation
Cannot be determined at this time

Cannot be determined at this time

PERSONNEL ACQUISITION & TRAINING

Acquisition

\$1 (79) = \$1.1K (80)/acft/yr

\$1.1 x 12 acft = \$13K/sqdn/yr

Alternative = Baseline Proposed SQML
÷ Baseline SQML
= \$1.1 x .80505
= \$.88K/acft/yr
= \$.88 x 12 acft =
\$11K/sq/yr

Individual Training

\$7 (79) = \$7.5K (80)/acft/yr

\$7.5 x 12 acft = \$90K/sqdn/yr

Alternative = Baseline (Proposed SQML)
÷ Baseline SQML
= \$7.5 x .80505
= \$6K/acft/yr
= \$6 x 12 acft = \$72K/sq/yr

APPENDIX C. O&S COST ESTIMATING MODEL

C.1 General.

For this analysis the Navy . . . model was used This model is a deterministic mathematical model which is preprogrammed and completely structured

C.2 Use & Application.

This model has been in use since . . . calculates annual squadron operating costs

C.3 Model Logic.

Table C-1 lists the algorithms used in the model logic

C.4 Results.

Tables C.2.A through C.2.() are the computer products identifying both input values and results for each alternative

GUIDANCE: THE FORMAT USED AND THE INFORMATION PROVIDED IN
APPENDIX C DEPEND ON THE COMPUTER MODEL USED.

TABLE C.1. O&S COST ESTIMATING MODEL ALGORITHMS

UNIT MISSION PERSONNEL

Aircrew

A = Aircrew (officer) x Officer Pay

B = Aircrew (Enlisted) x Enlisted Pay

Maintenance

C = Maint (Officers) (less air crew) x Officer Pay

D = Maint (Enlisted) x Enlisted Pay.

Other Personnel

E = Other Officers x Officer Pay

F = Enlisted x Enlisted Pay

UNIT LEVEL CONSUMPTION

POL

G = Consumption Rate x POL unit costs x flying

Hours per air craft x PAA acft/sqdn x K factor

Maintenance Material

H = 0 Level cost x

I = I Level cost x

[illegible]

PERSONNEL ACQUISITION & TRAINING

Acquisition

FF = Recruiting Cost factor x Sqdn Personnel x

Turnover Rate x K factor

Individual Training

GG = Specialty Training Cost x Sqdn Personnel x Annual Rate

x K factor

GUIDANCE: WHEN FACTORS ARE USED, INSURE THAT THE EQUATION FROM WHICH THE FACTOR IS DERIVED IS INCLUDED.

1

DATA FILE:

GENERAL

INPUT VALUES	OFFICER	ENLISTED	CIVILIAN	TOTAL
No of Aircrew	18	0	0	18
No of Maintenance Pers	1	133	0	134
Other Pers	1	43	0	44

POL costs - \$0.50/gal

[illegible]

Acquisition K factor - ...
Individual Training K factor - ...

TABLE C.2.A. (CONTINUED) ANNUAL SQUADRON OPERATION AND SUPPORT ANALYSIS
TIME. 1710.0 Fri 02/08.80 DATA FILE:

RUN RESULTS:

Unit Mission Personnel		\$2875
Aircrew	486	
Maintenance	1821	
Other	568	
Unit Level Consumption		\$5437
POL	4578	
Maintenance Material	631	
Training Ordnance	228	
Depot Level Maintenance		\$4285
Airframe Rework	840	
Engine Rework	1926	
Component Repair	602	
Support Equipment	11	
Software	100	
Modifications	-	
Other Depot	806	
Contract Unit Level Support	-	
Sustaining Investment		\$ 682
Reparable Spares	201	
Replacement Support Equip.	262	
Modification Kits	219	
Other Recurring Investment	-	
Installation Support Personnel		\$ 119
Base Operating Support	113	
Real Property Management	-	
Medical	6	
Indirect Personnel Support		\$ 239
Misc Operations & Maint.	-	
Medical O&M Non-Pay	93	
Permanent Change of Station	124	
Temporary Additional Duty Pay	22	
Depot Non-Maintenance		\$ 114
General Depot Support	114	
Second Dest Transportation	-	
Personnel Acquisition & Training		\$ 83
Acquisition	11	
Individual Training	72	
		<u>\$13,834</u>